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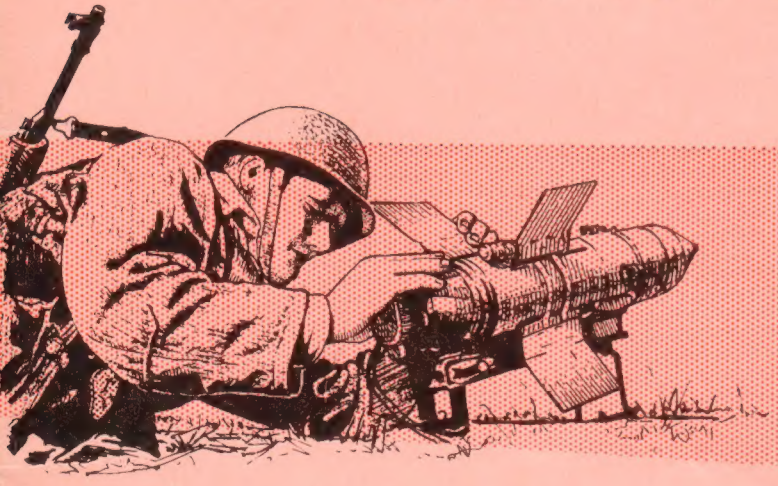
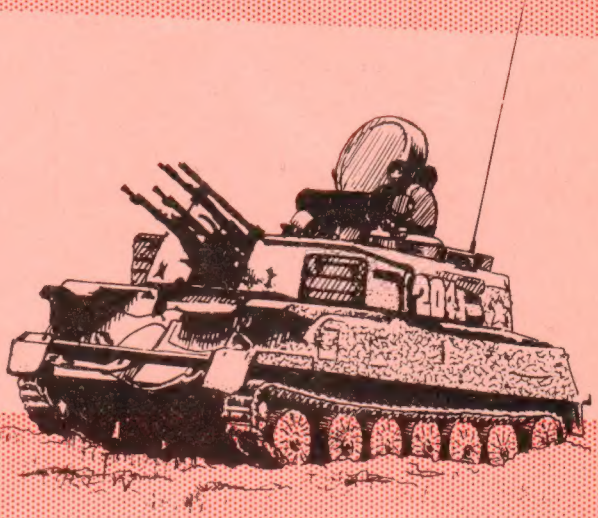
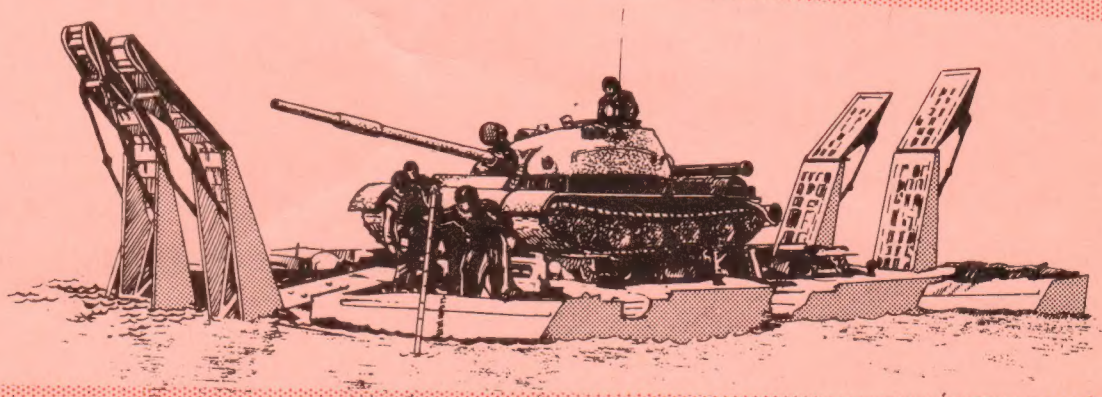
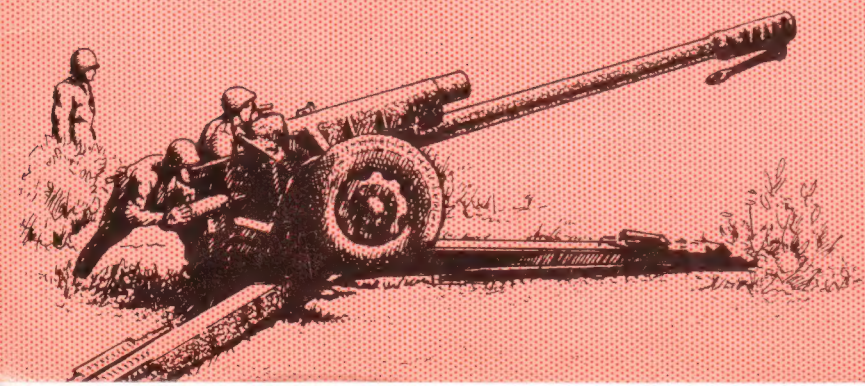
ARMY TECHNICAL INTELLIGENCE REVIEW

SUPPLEMENT - JULY 1974









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ARMY TECHNICAL INTELLIGENCE REVIEW No 105 (SECRET)

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FOREWORD

There are several topical articles in this issue. Much was said about the T-62 medium tank during the Arab/Israeli war and we are now able to up date our earlier assessments. The appearance of the two new Soviet self propelled guns in East Germany is an important development as is the extent of Soviet advances in passive night vision devices. The appearance of the HIND-A helicopter fitted with SWATTER ATGW is particularly interesting at this time.

The remaining three articles, while perhaps not quite so glamorous, do represent considerable advances in our knowledge of three important areas of Soviet military activity.

W A H FAIRBAIRN
Colonel
Tech Int (A)

1. The T-62 : An Update (SECRET)

Fig 1. T-62 Tank

Introduction

The phrase "many of the details of this tank are unknown to us", used in the Army Technical Intelligence Digest of January 1972, is happily no longer true. Recent events now allow us to confirm many of the assessed characteristics of this vehicle and the data given below may be used to update that given in the Digest. Current information is still being evaluated and a comprehensive reassessment will be issued in due course.

General

The T-62 is automotively very similar to its predecessor the T-55 and the protection and mobility of the two tanks is virtually identical. The T-62 is more difficult to steer; however this was to be expected since the track ground contact length is 390 mm longer than its predecessor and the L/C ratio has been raised to 1.6. There have been minor modifications to the optical instruments provided, for example the commander's peribinocular (TKN-3) is now a combined day/night vision device, but these modifications do not significantly improve the operational capability of the tank. A land navigation system is fitted to the command tank. The gun fire control equipment remains unaltered and the gunner and commander still rely upon the stadiametric system of range finding. In the recent Arab/Israeli war the tank proved its reliability and this would be expected from a model consisting as it does of well tried components common with T-55. The following general weaknesses in its design have become apparent:

a. External fuel tanks present a very high fire risk in battle.

b. Stowage of ammunition above the turret ring renders the tank very susceptible to ammunition explosions when hit. (See Fig 3).

c. Very cramped crew conditions (by Western standards) make the tank difficult to operate.

d. The heavy, cumbersome fixed ammunition is difficult to handle within the confines of the turret, making it impractical to achieve the firing rate claimed, ie 4 rpm from a static position.

e. Only some 6 rounds are battle-ready in stowage clips which are easily accessible. Other rounds are difficult to get at and even the slow rate of fire mentioned above is difficult to sustain.

Gun Performance

The 115 mm smooth bore tank gun (U-5TS) is a well conceived, simple, conventional equipment, which has been designed for maximum efficiency, without concessions being made to vehicle design or crew comfort. It fires three natures of fin stabilised ammunition, APDS, HEAT and HE (Fig 2) and the tank normally carries a mix of 40 rounds. The weights of the complete rounds are:

APDS: 22.5 kg HEAT: 26.2 kg HE: 28.1 kg.

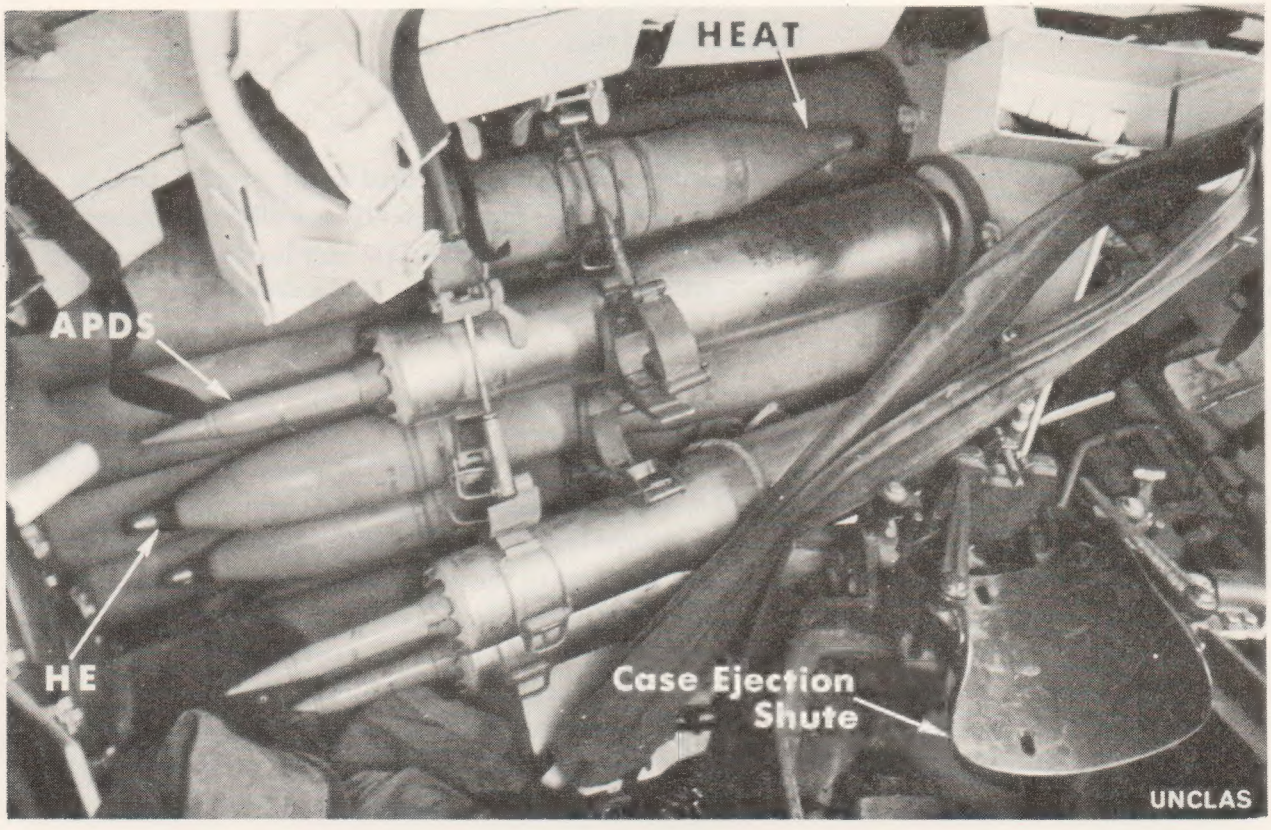


Fig 2. Ammunition Natures

Fig 3. A Battle Casualty

The HEAT and HE rounds are conventional in design with a performance comparable to Western rounds. Fig 3 shows in the foreground both the APDS and the HE projectile; an APDS and a HEAT projectile are shown in Fig 4. The APDS projectile is designed quite differently than any APDS round produced in the West, in that it has a short sabot and full calibre fins which act as a second bearing surface to stabilise the round in the barrel. The steel sabot fits onto the short threaded section and transfers the firing loads to the projectile. A slow spin is imparted to the round by some of the propellant gases as they escape through small holes drilled at an angle through the sabot. The full bore fins give the round high drag and make it susceptible to turbulent atmospheric conditions and both these factors operate against its satisfactory use at long range. The projectile has an in-flight weight of 4 kg and it is fired at a muzzle velocity of 1615 m/Sec, giving it an extremely flat trajectory. The round therefore has a very high chance of a first round hit at ranges out to approximately 1500 m. Ranging inaccuracies from the stadiametric system, combined with the limitations of the ballistic characteristics described above make the chances of a first round hit fall off beyond 1500 m.

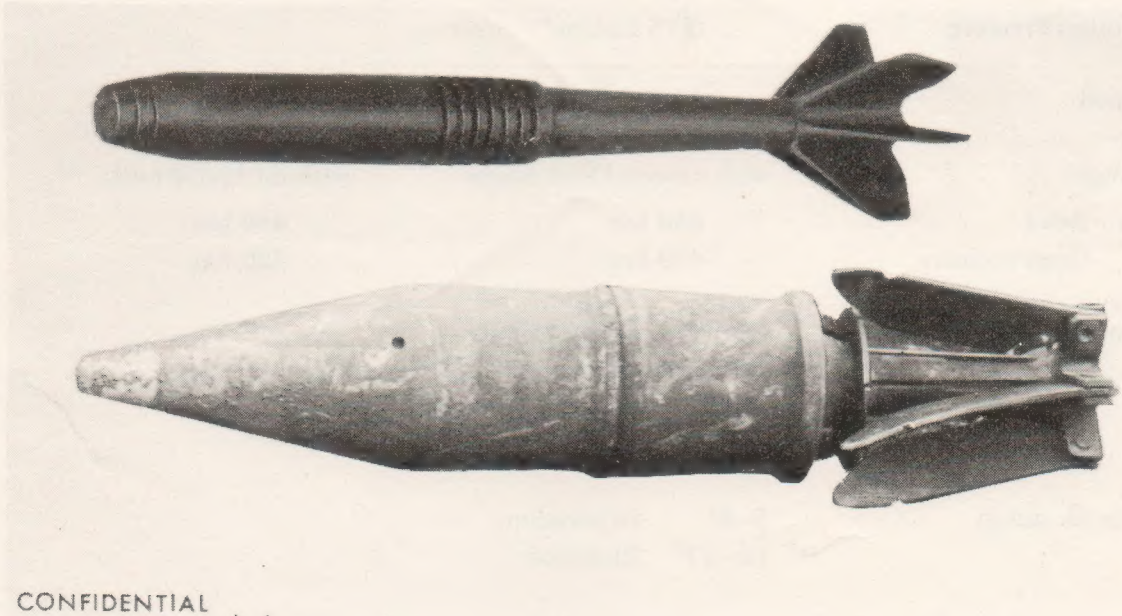


Fig 4. APDS and HEAT Projectiles

The penetration performance is assessed as at least 300 mm of armour, at normal, at 1500 m and it is likely that this penetration can be achieved at 2000 m or more providing a hit is made. Thus we should consider all current Western tanks as being vulnerable to attack by this round at ranges up to 1500 m.

Conclusion

The T-62 is a mechanically reliable vehicle, offering a fair level of crew protection and good cross country mobility. It is equipped with a gun capable of defeating the armour of current Western tanks by both kinetic energy and hollow charge attack. The chances of a first round hit are high up to 1500 m but fall off beyond that. Western tank guns still have a considerable advantage over this tank since they both out-range it and have a higher sustained rate of fire.

Technical Data

Crew	4	
Laden weight	37 tonnes	
Length (gun front)	9335 mm	
(gun rear)	9068 mm	
(hull)	6630 mm	
Width	3300 mm	
Height	2395 mm	
Power to Weight Ratio	15.7	
Ground Pressure	0.75 Kg/cm^2	
Speed	50 Kph (max)	
Range	with external fuel drums	without fuel drums
Road	650 km	450 km
Cross country	450 km	320 km
Ammunition	Normal Load 40 rounds APDSFS penetration 300 mm at normal/1500 m HEAT 440 mm at normal HE	
Gun Elevation	5–6° Depression 16–17° Elevation	

2. Two New Self-Propelled Guns.(SECRET)

It has been known since the Summer of 1973 that the Soviets were developing a self-propelled gun, probably of 152 mm calibre, and in March 1974, earlier than was expected, this gun appeared in the Group of Soviet Forces in Germany. Much to everyone's surprise there are in fact not one, but two SP guns, one of which is the 152 mm (?) which was expected, while the other is a smaller calibre weapon, possibly 122 mm.

Fig 1. Probable 152 mm SP Gun

Fig 1 shows the 152 mm(?) gun. It looks very similar to the one seen near Moscow on 23 August 1973, but the size and shape of the vehicle and some of the running gear can now be more clearly seen. The vehicle is 7.2 m (23.6 ft) long and approximately 3.05 m (10.0 ft) wide. The chassis looks very similar to the GANEF chassis with similar running gear and sloping front top deck, but it has 6 road wheels rather than the 7 which the original GANEF chassis has. The number of return rollers cannot be established from the photograph. The turret which is set well to the rear of the vehicle looks very large and makes the overall height 3.25 m (10.67 ft). The gun is some 12 ft long with a fume extractor and probably a large muzzle brake.

It has been seen in motor rifle divisions in battalion strength and it is thought likely that it will appear in tank divisions as well.

All that is known about the smaller (122 mm ?) gun is:

a. The vehicle is 7.4 m (24.48 ft) long, not including the protuberance which can be seen on the rear. It is thought unlikely that this is a spade since not all of the vehicles seen were fitted with it; anyway a spade should not be necessary for a gun of this calibre.

b. The width is approximately 3.12 m (10.25 ft). The vehicle has a low profile but a prominent commander's cupola and the overall height is 2.35 m (7.7 ft).

c. The calibre is not confirmed but the evidence points to 122 mm which would be a logical choice for the Soviets. The barrel is about 12 ft long and there is a muzzle brake and possibly a fume extractor.

d. There is a large square object on the barrel which is believed to be a night viewing device.

e. The chassis is similar in outline to that of the PT-76 light amphibious tank, but is 1.8 ft longer and has 7 disc type road wheels rather than 6. The drive sprocket is at the front with an idler at the rear.

f. The estimated weight of the vehicle is 25 tonnes and it is thought more likely that it will wade rather than swim, particularly as there is a tube on the front deck which may well be a schnorkel.

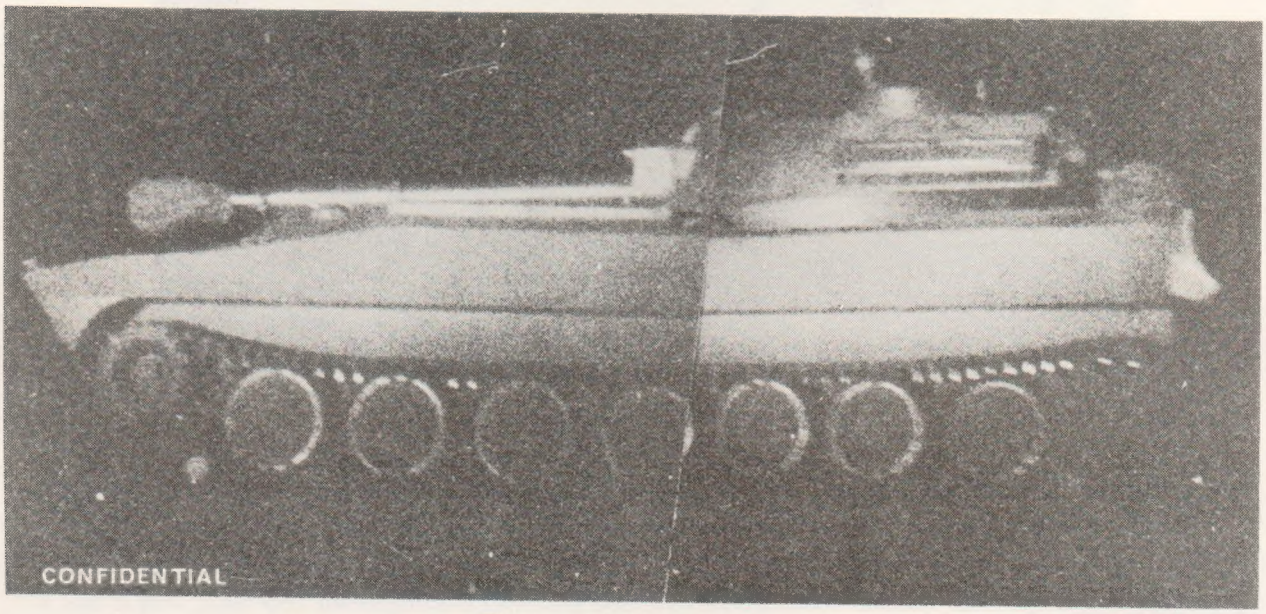


Fig 2. Medium SP Gun

The design is unusual for an SP gun in that the vehicle has the general appearance of a lightly armoured amphibious tank. The tank-like turret is not however round and has large panniers on the sides and back, and the gun can be elevated to 60°. The hull is also too long to allow the vehicle to have the good mobility which would be required of a tank, and the general layout of a front engine and turret set right at the back of the hull is not only totally unlike any known Soviet tank, but conforms closely to conventional SP gun design.

Six of these vehicles were seen in the first sighting, indicating a battery sized unit. We believe that this SP gun will replace the 122 mm Howitzer D/30 battery in motor rifle regiments equipped with BMP in both tank and motor rifle divisions.

3. SOVIET Helicopter Mounted ATGW (CONFIDENTIAL)

Fig 1. SWATTER Rails on HIND-A

The recent sighting of four SWATTER launch rails on the HIND-A helicopter (Fig 1) has reinforced our view that SWATTER is the most likely Soviet ATGW system to be mounted on a helicopter. The HIND helicopter was first sighted at Moscow in June 1971 and subsequently seen in GSFG in September 1973. Two variants have been identified so far, HIND-A with an anhedral wing and HIND-B with a straight wing. The particularly slim and clean fuselage, together with internal fuel tanks and retractable undercarriage indicates that the HIND has been designed for high speed performance.

In addition to the four SWATTER launch rails, HIND-A carries four 32 shot, 57 mm air to surface rocket pods and has a 12.7 mm Model A-12.7P machine gun mounted in the nose.

There are two versions of the SWATTER missile; SWATTER-A was first seen in November 1962 and the newer, modified version, SWATTER-B first appeared in November 1967.

It is considered that the SWATTER-B missile (Fig 2) with its increased range would be the version mounted on the HIND-A.

Fig 2. SWATTER 'B'

The improved SWATTER-B missile is assessed as having a maximum range of 3500 m and a minimum range of 600 m. It is 1.13 m long, 130 mm in diameter and weighs about 26.5 kg. The HEAT warhead has an estimated weight of 6.7 kg and is assessed as having a penetration of at least 500 mm through armour.

On the BDRM mounted SWATTER system, guidance is by manual command, line of sight guidance through a radio command link. The operator tracks the missile and target through an optical system.

It has been thought that the incorporation of a semi automatic guidance system would be one method of upgrading the existing SWATTER system, but there is no evidence at present to show that such a modifcation has been made to the helicopter mounted version.

Fig 3. Probable SWATTER fired from HARE

Prior to the sightings of the launch rails on HIND-A the main evidence in favour of SWATTER as a helicopter mounted ATGW was a Soviet film sequence showing a missile being fired from a HARE helicopter. (Fig 3). This showed the V shaped plumes characteristic of a SWATTER launch. (Fig 4).

Fig 4. SWATTER Launch from BRDM

4. Developments in Soviet Engineer Equipment (SECRET)

INTRODUCTION

This article updates the report on the armoured engineer tractor M-1972 published in ATIR Supplement No 102 dated January 1973 and discusses two new pieces of engineer equipment, the regimental earth digging machine PZM and the BTR-50 PK mine clearer M-1972.

ARMOURED ENGINEER TRACTOR M-1972 (Figure 1)

Recent sightings of the armoured engineer tractor M-1972 have confirmed our previous assessment of this equipment. The hydraulic crane, which is armoured, has a 360° rotation and the attachment on the end of the crane boom is a grab. When lifting objects such as trees from in front of the vehicle the multi-purpose bulldozer blade can be lowered to the ground to increase the stability of the vehicle.

The bucket attachment which when in use is fitted to the end of the crane boom is carried over the left track guard. It is mounted on one end of a frame, the other end of which is pinned at the rear of the vehicle. The bucket and frame can be rotated vertically through 180° by an hydraulic cylinder, bringing the bucket into a position where it can readily be attached to the boom. The bucket has not yet been seen in use.

This equipment was issued widely during 1973 at a scale of 2 in each divisional engineer battalion.

Fig 1. Armoured Engineer Tractor M-1972

REGIMENTAL EARTH DIGGING MACHINE PZM (Figures 2 and 3)

Although this equipment was described in the Soviet military press in early 1971 it did not appear in GSFG until June 1972. It is based on the new 150 hp wheeled tractor T-150K which has been fitted with a bulldozer blade and an hydraulically powered multi-bucket chain excavator. The bulldozer blade is used to clear a path for itself, to dig vehicle scoops and to fill craters and trenches. The excavator will dig trenches and wider excavations can be made by moving the excavator from side to side through a horizontal angel of 23° to each side of the vehicle axis. The normal trenches dug measure 1.1 m deep x 0.6 m wide (bottom) x 0.9 m wide (top) and the larger excavations can be up to 3 m deep x 3.2 m wide. The soil excavated may be deposited on either side of the trench by a rotary ejector. Figure 3 shows the excavator in its transport position. This equipment is appearing in engineer companies, possibly at a scale of 2.

Fig 2. Excavator down

Fig 3. In travelling position

Regimental Earth Digging Machine PZM

BTR-50 PK MINE CLEARER M-1972 (Figures 4 and 5)

Probably the most significant engineer equipment to appear recently is the BTR-50 PK mine clearer M-1972. It is a rocket projected explosive hose mine clearing device based on a modified BTR-50 PK armoured personnel carrier. It projects an explosive hose approximately 135 m long into a minefield from a distance of about 400 m. Should the minefield be greater than about 135 m in depth a second hose can be projected from the same vehicle to increase the depth of the lane.

In addition to the rocket and its attaching cable, we believe that the major components of this equipment are as follows. The explosive part consists of a hose approximately 80 mm in diameter divided into segments 1.2 m long. The segments are connected into sections approximately 9.6 m long. About 14 of these sections are folded and carried in each half of a 2 compartment box that is located in the vehicle passenger compartment. In the operational configuration, one end of each hose is connected to a rocket located in a 2 rail rocket launcher mounted on the rear deck over the engine and transmission. The other end is attached to approximately 400 m of smaller hose that is carried in

three square boxes on either side of the launcher. The other end of this small hose is connected to a horn-like object on the vehicle's nose.

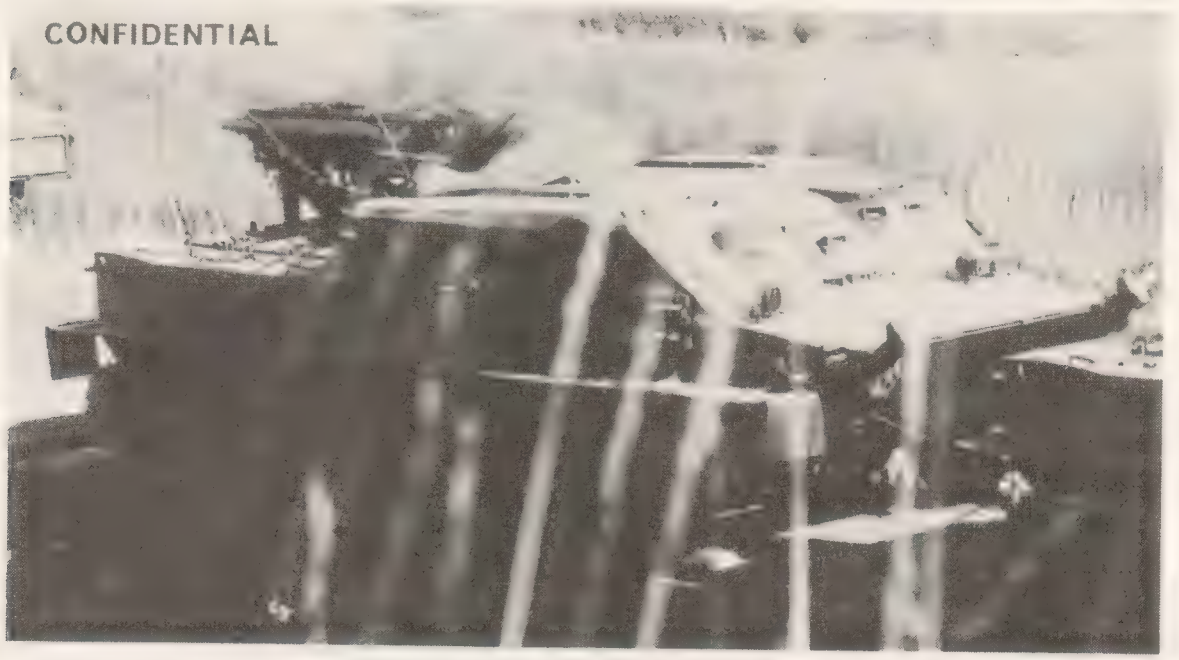


Fig 4 BTR-50 PK Mine Clearer M-1972

When the rocket is fired it pulls the segmented hose from the passenger compartment box. This is followed by the smaller hose which anchors the system to the vehicle and probably provides a detonation link. This is illustrated in Figure 5.

We estimate that this equipment will clear a 6–7 m wide gap through conventionally fused mines.

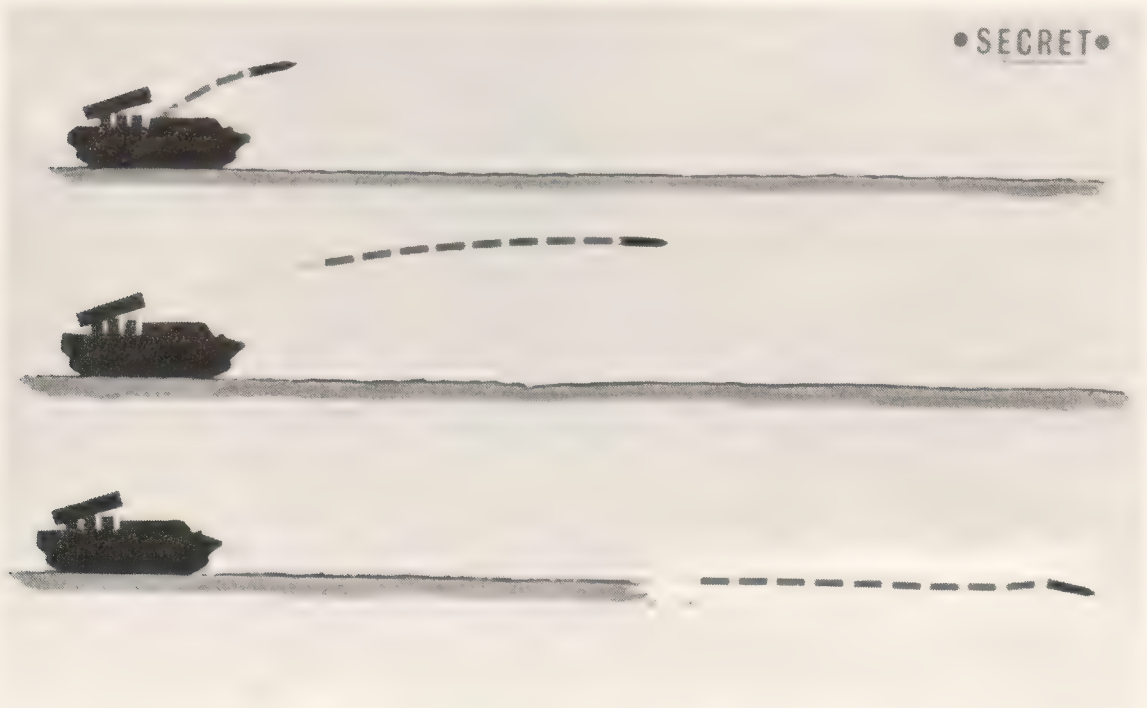


Fig 5. Operation of BTR-50 PK Mine Clearer M-1972

5. Soviet Night Vision Equipment (CONFIDENTIAL)

GENERAL

The Soviet Army has, for many years, been equipped with active night vision aids. These devices are widespread and used with small arms, artillery, soft-skinned vehicles and tanks. They rely on searchlights or headlights, filtered to allow only the 'invisible' infra-red rays through.

The disadvantages of such active systems are:

a. With equipment similar to the device's own viewer (which converts the infra-red light reflected from the target, into a visible picture) the illumination can be seen by the target and by others over a wide area. The searchlight itself can easily be seen.

b. The range of active devices depends on the power of the searchlight (which is reduced anyway by the filter), the clarity of the atmosphere and the sensitivity of the viewer. Even on the larger systems, the practical range is less than 1000 m.

The Soviets are well aware of these disadvantages and are striving to replace their active equipment, where necessary, with passive devices. Passive devices amplify what little background light there is (and there must be some –starlight or moonlight) and so do not advertise their presence with detectable searchlights.

The extent to which passive devices have been deployed in the Soviet Army is not known. We do know that such equipment was used by the Egyptians (and captured by the Israelis) in the recent Middle East War. This may indicate that either the Soviets have sufficient passive equipment in their army to be generous to their allies, or that they have no further use for these models and have progressed (or are progressing) to better things.

This article describes the current Soviet night vision equipment, including the passive devices used in the Middle East War and predicts the most likely trends for the future.

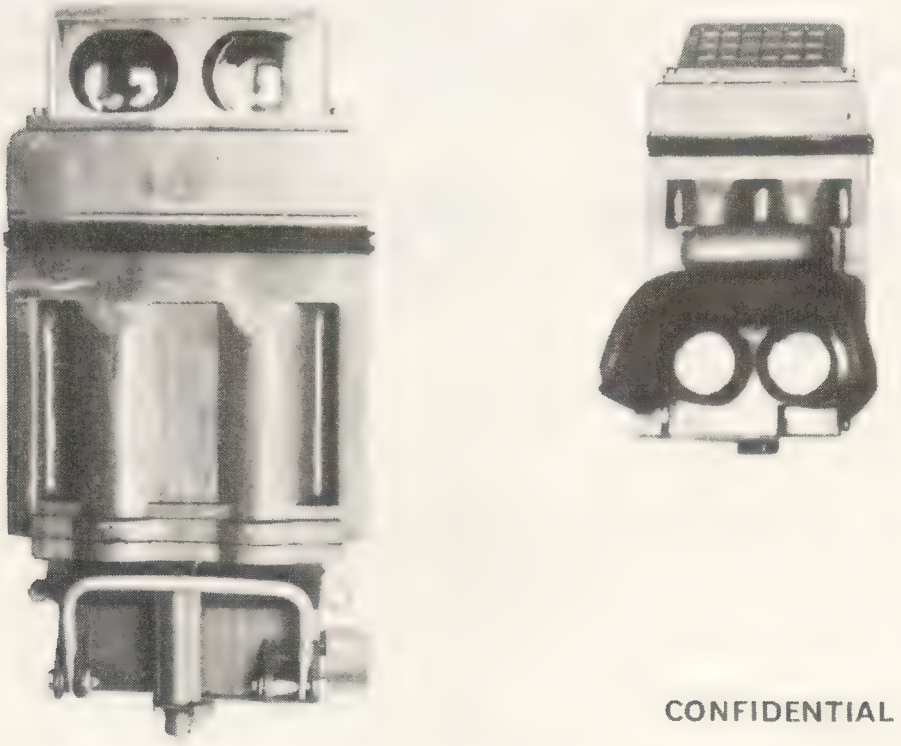
DRIVING AIDS

PNV-57 (Fig 1) These driver's goggles have 2 'image converter' tubes and use the vehicle headlights, suitably filtered, to see approximately 30 m.

RESTD.

Fig 1. PNV-57

TVN-2 (Fig 2) This is a periscopic device used by AFV drivers and, with the aid of the filtered vehicle headlights, gives a range of about 50 m.



CONFIDENTIAL

Fig 2. TVN-2

SMALL ARMS

Rifles and MGs. The NSP-2 and PPN-2 (Fig 3) have been in service for many years and are easily identified by the spotlight mounted above the viewer. The passive replacement for the NSP-2 is the NSP-3 (Fig 4) which is used on RPK and AKM rifles. It is an image intensifier (II) with a useful range of about 250 m against infantry in clear starlight conditions. The passive replacement for the PPN-2 is the PPN-3. Although there is no photography available at this time, it is reported to look very similar to NSP-3.

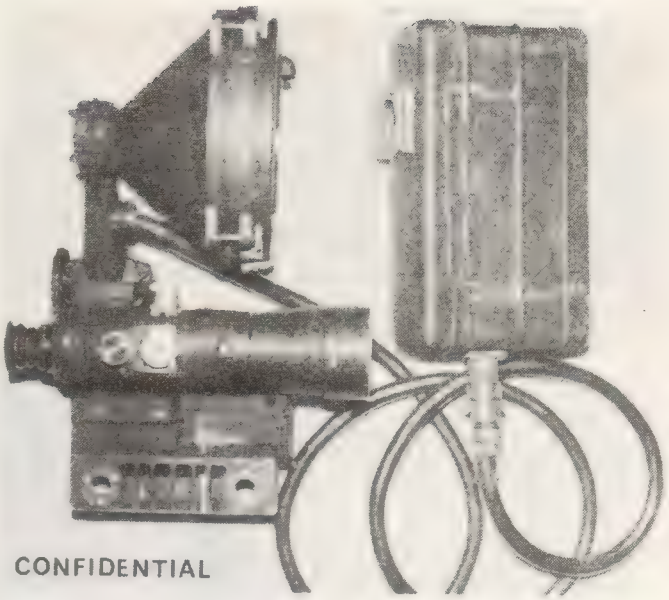


Fig 3. PPN-2

Fig 4. NSP-3

Rocket Launchers. The PGN-1 (Fig 5) is a larger version of NSP-3 and is used with the RPG-7 RL. It is also an II device and has a useful range of about 450 m against tanks.

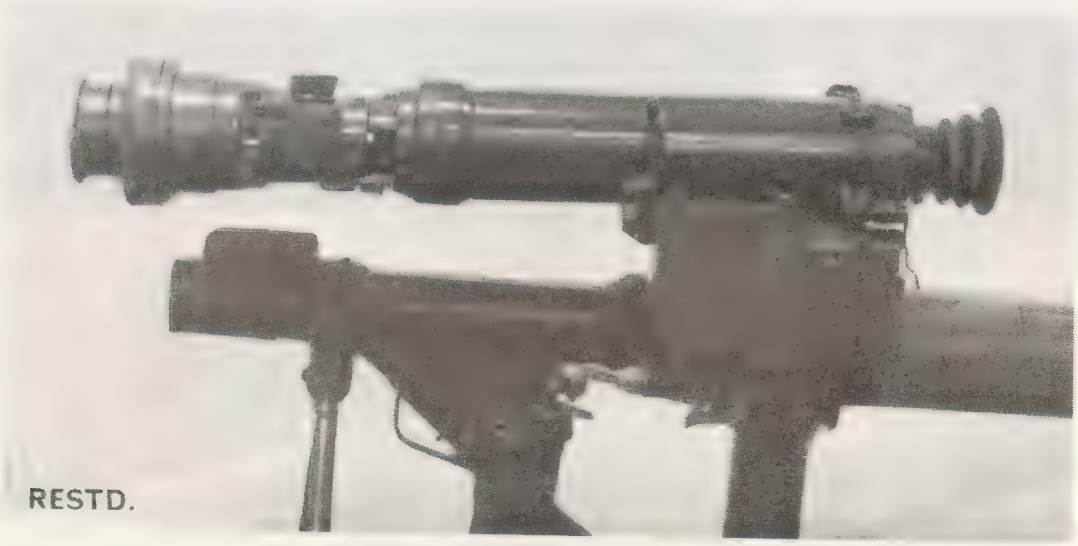


Fig 5. PGN-1

ARTILLERY

On Soviet anti-tank guns, the old APN-3 (Fig 6) with its huge searchlight (useful range about 1000 m) is being replaced by a passive equipment which we identified as the APN-5-40. The nomenclature NNP-20M was seen on equipment captured from the Egyptians (Fig 7). However, what we have called APN-5-40 and what we have seen inscribed NNP-20M, are so similar as to be almost certainly the same equipment, although used for different purposes. They are II devices with a useful range of about 1000 m against tanks.

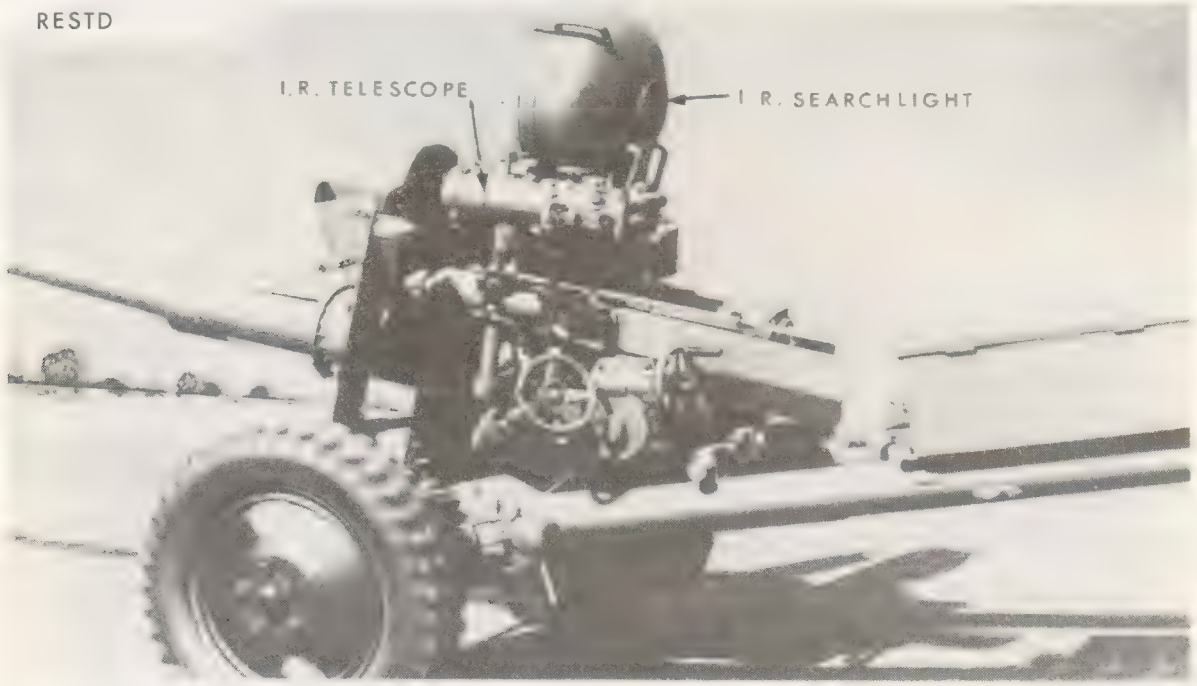


Fig 6. APN-3

Fig 7. NNP-20M

AFVs

TKN-1 or 3. The tank commander has a TKN-1 (Fig 8), or on later tanks, a TKN-3, for observation. This makes use of the commander's own OU-3G infra-red searchlight over a useful range of about 400 m. With the aid of his gunner's more powerful L-2G searchlight, his range would be extended to about 700 m.

Fig 8. TKN-1

TPN-1 (Fig 9). The tank gunner uses a TPN-1 sight in conjunction with his L-2G searchlight over a range of about 800 m.

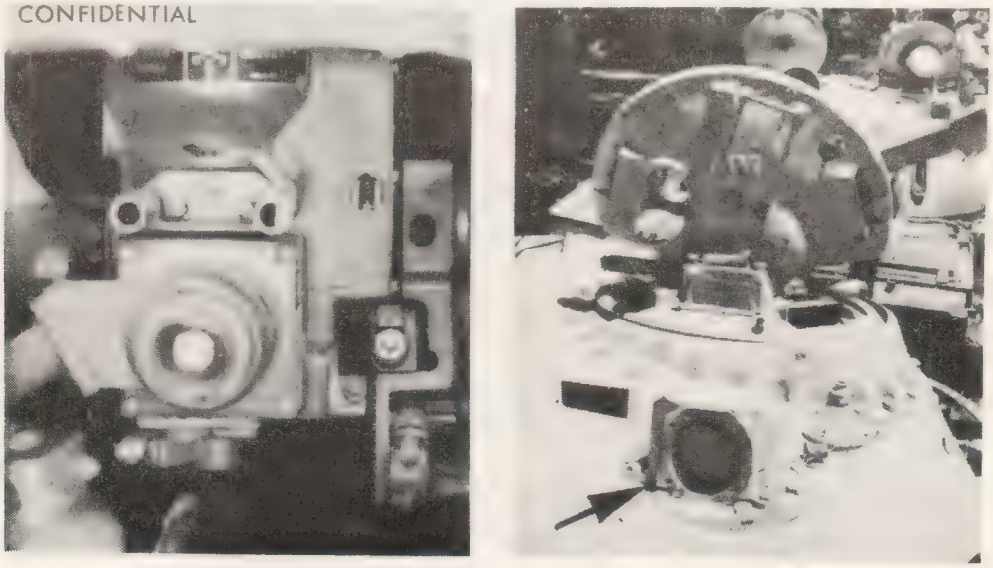


Fig 9. TPN-1

TVN-2. AFV drivers use TVN-2 (Fig 2) as described on page 18.

Passive Devices. We have not yet seen any passive devices fitted to tanks, but BMP has a passive gunners sight which can be used for the main armament or the MG, though not the SAGGER ATGW by night.

RECENT DEVELOPMENTS

II devices suffer from one serious defect – they cannot look at bright lights (explosions, tracer flares etc). Early equipments lost their picture completely (and in some cases permanently) and took some time to 'recover', even from the flash of the weapon being fired. Modern II equipment can protect itself electronically, but is still blinded so long as the unwanted illumination lasts.

A development of II is the Channel Plate Multiplier (CPM). This also amplifies available light, but is smaller, lighter, and is not blinded by lights. It is therefore much better for both surveillance and weapon firing

Neither the II nor CPM can exceed 1000–1500 m in range without using outsize optics and relying on bright moonlight nights.

The latest and possibly the most significant development in night vision does not have the disadvantages of blinding or limited range. Thermal imagers operate in the far infra-red part of the spectrum, using the heat given off by all objects (Fig 10). These devices can operate by night or by day, are not seriously affected by tracer, flares or battlefield illumination generally. They have a useful range in excess of 3 km and can work through mist, smoke, light rain and even light camouflage.

Fig 10. Thermal Image – Tank at 300 m

At the moment the disadvantages of thermal imagers are their high cost and their need for liquid air cooling. Both of these factors are expected to be brought within acceptable limits soon.

PREDICTIONS

Short Range. (0-500 m) Rear area logistic vehicles will continue to use the active devices which are in such plentiful supply. Further forward, a passive version of the driving goggles can be expected. On small arms, passive devices like the NSP-3 and PGN-1 will become widespread. It may be that, if the Soviets have not already gone into quantity production, we will see improved versions issued (the Egyptians made unfavourable comparisons between the Russian equipments and their Western equivalents), or we may see CPM devices being used. Certainly CPM devices will eventually replace the inferior II equipment.

Predictions (continued)

Medium Range (0–1500 m). Both tanks and artillery would benefit from the advantages of the CPM over the II devices. Again it depends upon how far the Soviets have got with their re-equipment programme. As Soviet tank gunnery philosophy makes it unlikely that fire will be opened outside the normal battle range (about 1500 m), then II or CPM equipment could provide adequate ranges for tank gunners.

Long Range (over 1500 m). It is likely that Thermal Imagers will be introduced into the Soviet Army very gradually, to supplement other passive devices. Prior to 1980 however, these expensive equipments will probably be restricted to reconnaissance troops and possibly ATGW troops – we have not yet seen any night firing aids for ATGWs.

SUMMARY

The general picture is a familiar one – the Soviets gradually increasing their capability with new and improved equipment, whilst still retaining old equipment for as long as it can be useful.

We must not lose sight however of the Soviets' great affection for the simple and reliable solution. However sophisticated their night vision equipment may become, they will undoubtedly retain the ability to turn night into day with ordinary white light.

6. Soviet Probable Tropospheric Scatter Radio System 'TWIN EAR' (SECRET)

Fig 1. TWIN EAR

Tropospheric scatter radio systems are used to provide point-to-point multi-channel communications over a relatively long distance. They operate at distances up to approximately 800 km, have a power output of about 100 W to 10 kW, and use a very wide band of frequencies greater than 100 MHz. A primary advantage of tropospheric scatter is the reduced requirement for relays thereby allowing for communications over difficult terrain. Tropospheric scatter systems have a very high reliability when properly engineered. Another advantage is that they are difficult to jam.

Fig 1 shows a new Soviet equipment nicknamed TWIN EAR, which is believed to be a tropospheric scatter radio set. It is mounted on the URAL-375 box-bodied vehicle (BBV). On the roof of the box body are mounted two parabolic antennas, each having a diameter of approximately 2700 mm, and spaced 1240 mm apart. The forward antenna is folded over the rear antenna when prepared for travel or storage. Both parabolae are inclined forward at 65 degrees when in operation. The antennas are fed by a horn extending outward from the base of each antenna about 1375 mm. Another URAL-375 BBV associated with TWIN EAR is believed to house a generator. TWIN EAR was first seen near Moscow in 1969 and in GSFG in October 1973.

The Soviets now have four known transportable tropospheric scatter radio systems. The two with the largest antennas are nicknamed TWIN PAN and TWIN DISH. These systems are used primarily for strategic communication purposes, providing long distance links between Warsaw Pact countries and the Soviet Union. The third, TWIN PLATE, has a smaller antenna and is used to provide communications within and between Pact countries. The role of TWIN EAR is not clear, but it may be to provide communication links for air defence and other units.

The Soviets appear to have sufficient tropospheric scatter systems to meet their current requirements. The trend in design, since the introduction of TWIN DISH around 1960, has been toward increased mobility, greater channel capacity and a reduction in the time required for site installation.

7. Protective Respirators (CONFIDENTIAL)

The ShLEM respirator has been in service since 1940. It has been used by the Soviet and Warsaw Pact forces, Yugoslav, Chinese and Egyptian armies. Evidence is now pointing to its withdrawal and replacement by more modern respirators and in particular, in the last few years, new masks have been produced by Czechoslovakia, Hungary and China or North Vietnam.

Czechoslovakia

The M-10 (Fig 1) was introduced into the armed services in 1970 after 5 years development and testing. The designers seem to have been influenced to a large extent by the US M-17 (Fig 2).

Fig 1. Czech M-10

Fig 2. US M-17

The mask has a face piece of rubber held in place by a head harness. The sealing line goes under the chin, over the cheeks, temples and forehead.

The eye pieces are a notable improvement, giving a reported 90% of normal vision. Wearers who require spectacles can be catered for by the insertion of lenses (probably in the form of a pince-nez), in the mask. Misting of the eye pieces is prevented by separating the nose and mouth from the rest of the mask interior by an inner half-mask.

At the front of the mask on the "snout" is located the voice emitter and the outlet valve. No adaptation is needed for communication by voice or radio.

The air filters are cheek-mounted and offer a much lower breathing resistance than the ShLEM. The location of the filters is a potential weak spot. Like those of most masks, the filters of the M-10 can be overcome by attack from hydrogen cyanide and would require to be replaced. The M-10 would have to be removed for several minutes to do this, exposing the wearer to further risk.

Hungary

Little is known about this mask (Fig 3) but its designation is suspected to be TSM. It consists of a rubber hood to cover the head with two cut out parts either side of the crown. A strap around the neck completes the fastening.

The mask has a filter canister on the left hand side and appears to be unwieldy. Unlike the M-10 which has a centre of gravity close to the face and hence is comfortable, this mask appears less so.

There is a voice emitter at the front below which is a possible connector for a hose or an outlet valve. The face piece has a similar appearance to the ShMS optical mask.

Fig 3.

Hungarian Respirator 1972

China/North Vietnam (Fig 4)

This mask was captured from NVA soldiers in Vietnam before the cease-fire. It is a complete face mask with harness straps and head-pad. The eye pieces are larger than those of the ShLEM, are made of plastic and are crimped onto the mask. They are easily damaged and difficult to replace in the field.

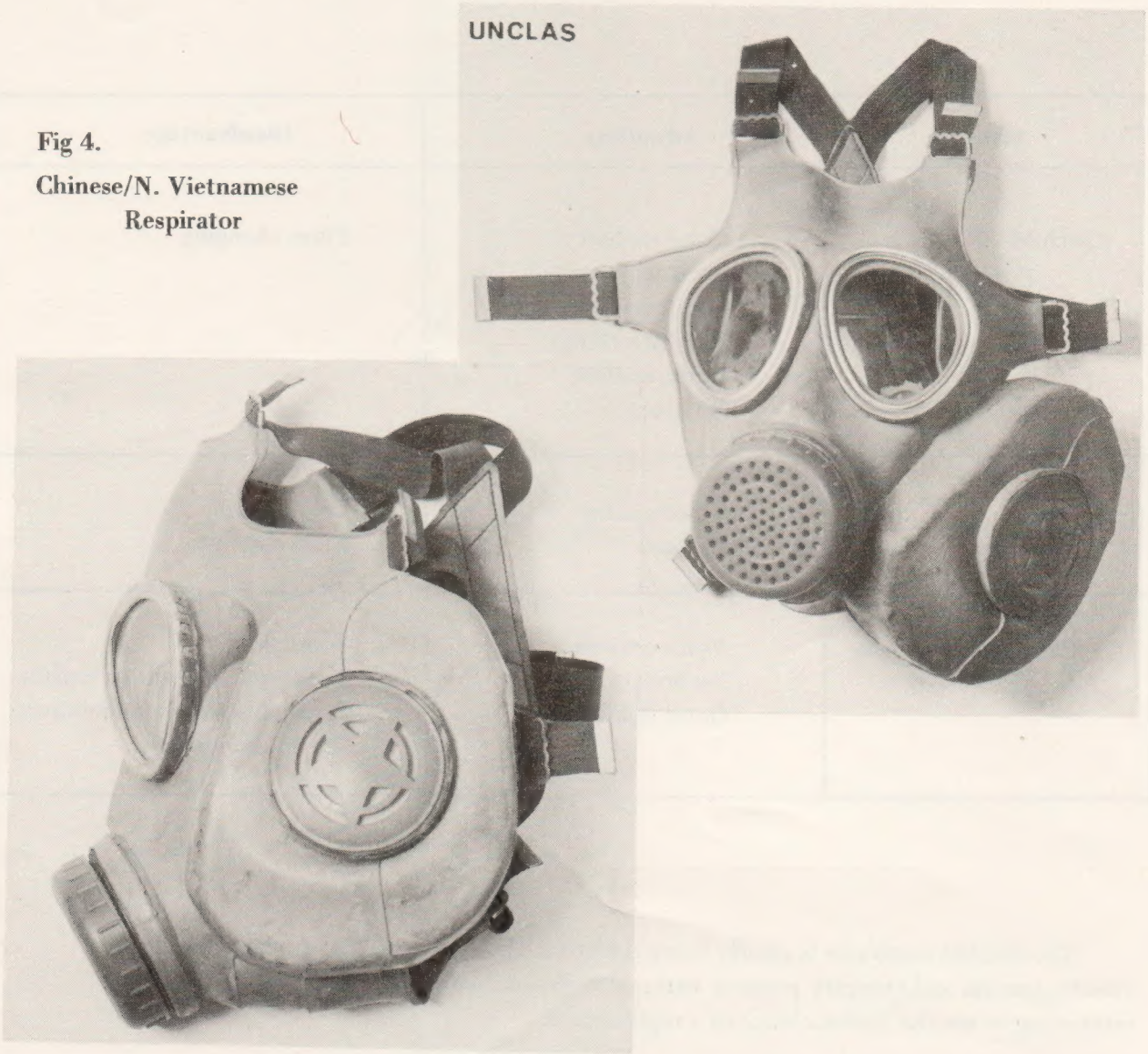


Fig 4.
Chinese/N. Vietnamese Respirator

The filter is mostly encased in rubber and has a star emblem embossed on it. It is relatively crudely made and gives only a low measure of protection. The mask is suspected to be of Chinese origin and its designation is not yet known.

CONCLUSION

The characteristics of the masks are summarized below:

Item	Advantage	Disadvantage
Czech M-10	Good visibility Spectacle inserts Comfortable Easy Breathing Voice emitter No hose	Filter changing
Hungarian Respirator	Voice emitter No hose	Unwieldy Poor visibility
Chinese/Vietnamese Respirator	Voice emitter No hose Good visibility	Poor filter Eyepieces difficult to replace Perishable rubber membrane in voice emitter

The ShLEM respirator is clearly being replaced. The appearance of 2 new masks from Czechoslovakia and Hungary point to national variations within the Warsaw Pact. It will be interesting to see the Soviet choice of a replacement.